

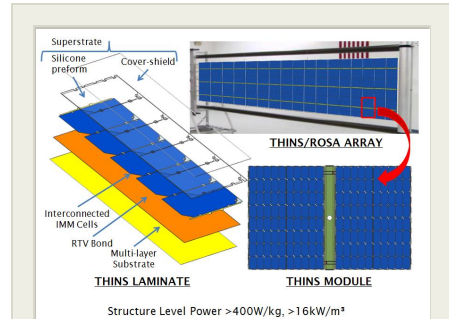
## Thin Flexible IMM Solar Array, Phase II

Completed Technology Project (2012 - 2014)



## Project Introduction

Thin, flexible, and highly efficient solar arrays are needed that package compactly for launch and deploy into large, structurally stable high power generators. Inverted Metamorphic Multi-junction (IMM) solar cells can enable these arrays, offering higher efficiencies of  $>33\%$  and lower mass and flexibility, but integration challenges of this thin crystalline cell technology need solution. The Thin Hybrid Interconnected Solar-Array (THINS) technology allows robust and reliable integration of IMM cells into a flexible blanket comprising standardized modules engineered for producibility. The modules support the IMM cell by using multi-functional materials for structural stability, shielding, CTE stress relief, and integrated thermal and electrical functions. The Phase I effort demonstrated the feasibility of key THINS component, including the structurally stabilized IMM cell, and integration with advanced multi-functional substrate and superstrate components, and completed the modularity approach for interfacing into the Roll Out Solar Array (ROSA) deployable structure, while improving standardization and manufacturability. Design evaluation shows figures of merit for array level specific power, including deployable structure, greater than  $400\text{W/kg}$  and volumetric efficiency greater than  $15\text{kW/m}^3$ , significantly higher than current approaches. The low mass and low stowed volume provides a path to package  $300\text{kW}$  in a single launch with a deployment approach that uses simple, robust mechanisms. Phase II advances the THINS/ROSA technology, incorporating advanced 4-Junction IMM solar cells into THINS modules using demonstrated spaceflight qualified materials, testing module coupons in thermal cycling and plasma environments, fabricating a full-scale module to demonstrate automatable manufacturing processes, integrating that module and inactive modules (with cell simulators) into the ROSA deployable structure, and culminating in a full-scale deployment demonstration.



Thin Flexible IMM Solar Array

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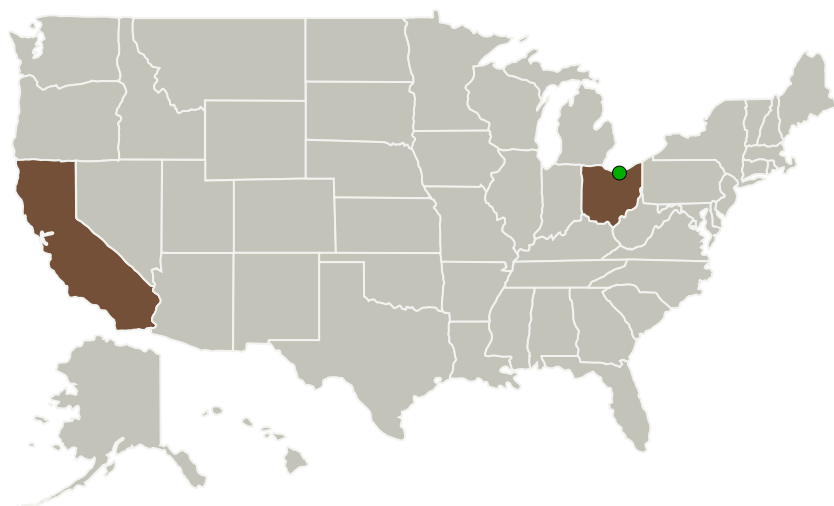
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## Primary U.S. Work Locations and Key Partners



Organizations Performing Work	Role	Type	Location
Vanguard Space Technologies, Inc	Lead Organization	Industry	San Diego, California
● Glenn Research Center(GRC)	Supporting Organization	NASA Center	Cleveland, Ohio

## Primary U.S. Work Locations

California	Ohio
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## Project Transitions

▶ **May 2012:** Project Start

✓ **May 2014:** Closed out

## Closeout Documentation:

- Final Summary Chart(<https://techport.nasa.gov/file/140671>)

## Organizational Responsibility

## Responsible Mission Directorate:

Space Technology Mission Directorate (STMD)

## Lead Organization:

Vanguard Space Technologies, Inc

## Responsible Program:

Small Business Innovation Research/Small Business Tech Transfer

## Project Management

## Program Director:

Jason L Kessler

## Program Manager:

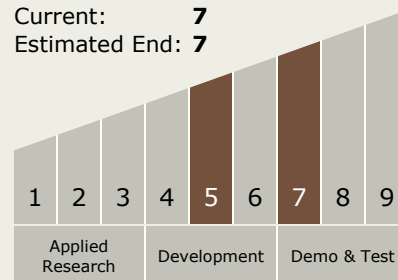
Carlos Torrez

## Principal Investigator:

Nicholas Walmsley

## Technology Maturity (TRL)

Start: **5**  
Current: **7**  
Estimated End: **7**

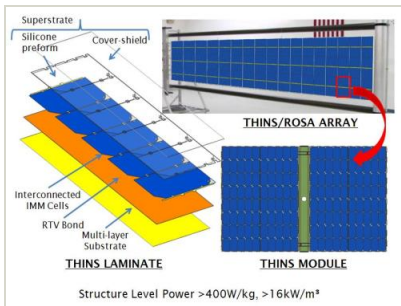


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### Images



### Project Image

Thin Flexible IMM Solar Array  
(<https://techport.nasa.gov/image/132657>)

### Technology Areas

#### Primary:

- TX03 Aerospace Power and Energy Storage
  - └ TX03.1 Power Generation and Energy Conversion
    - └ TX03.1.1 Photovoltaic

### Target Destinations

The Sun, Earth, The Moon, Mars, Others Inside the Solar System, Outside the Solar System